REMARKS

Reconsideration and allowance are respectfully requested.

Claims 68, 72, 76-78, 80, 83, 85-149 and 151-172 are pending. Claims were withdrawn from consideration by the Examiner as directed to nonelected subject matter. Their rejoinder is requested upon allowance of the elected claims.

35 U.S.C. 112 – Definiteness

Claim 150 was rejected under Section 112, second paragraph, as allegedly "indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." Applicants traverse because cancellation of claim 150 renders this rejection moot.

Applicants request withdrawal of the Section 112, second paragraph, rejection.

35 U.S.C. 103 – Nonobviousness

A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. *In re Kahn*, 78 USPQ2d 1329, 1334 (Fed. Cir. 2006) citing *Graham v. John Deere*, 148 USPQ 459 (1966). The *Graham* analysis needs to be made explicitly. *KSR v. Teleflex*, 82 USPQ2d 1385, 1396 (2007). It requires findings of fact and a rational basis for combining the prior art disclosures to produce the claimed invention. See id. ("Often, it will be necessary for a court to look to interrelated teachings of multiple patents . . . and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue"). The use of hindsight reasoning is impermissible. See id. at 1397 ("A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning"). Thus, a *prima facie* case of obviousness requires "some rationale, articulation, or reasoned basis to explain why the conclusion of obviousness is correct." *Kahn* at 1335; see *KSR* at 1396. A claim directed to a combination of prior art elements "is not proved obvious merely by demon-

strating that each of its elements was, independently, known in the prior art." Id. Finally, a determination of prima facie obviousness requires a reasonable expectation of success. See *In re Rinehart*, 189 USPQ 143, 148 (C.C.P.A. 1976).

Claims 68, 72, 76-78, 80, 83, 85-95, 114-129 and 149-160 were rejected under Section 103(a) as allegedly unpatentable over Akimoto et al. (U.S. Patent 4,916,066) taken with Barclay (U.S. Patent 5,656,319) and Huang et al. (U.S. Patent 4,056,638) and further taken with Langejan (U.S. Patent 3,843,800) and Groenendaal (U.S. Patent 5,716,654). Applicants traverse.

The Office has not established that all limitations recited in the pending claims were known in the prior art. With regard to the assertion on page 3 of the Action that "the adjustment of composition properties for optimization purposes identified as result-effective variables cited in the references would have been prima facie obvious to a person having ordinary skill in the art" (emphasis added). But it was not explained in the Action where in the cited documents the claim limitations missing therefrom were identified as result-effective variables and as results to be optimized. For example, Applicants teach that impeding solvent penetration during extraction is a problem avoided by the claimed invention and that solution is not taught or suggested by the cited documents, which do not disclose optimizing variables to achieve this result (or any other result). Applicants respectfully request that the Office indicate in the next Action what result can be achieved by optimizing the size of the particles in the cited documents, and where that result is disclosed in the cited documents. See, for example, Applicants' claims 94, 121 and 149. The cited documents do not teach or suggest that prior art granules are porous enough to allow solvent access (and no other evidence is cited in the Action to prove such accessibility).

Barclay and Huang disclose the use of their compositions as food, but this does not require the specific variables recited in the claims. Applicants submit that the structural difference between their claimed invention and the disclosed granules of the cited documents is, in at least one aspect, the size of the granules. Without the disclosure of granule size as claimed, and without any mention of size being a result-effective vari-

able, the Office has not established that this claim limitation would have been obvious and, therefore, has not established *prima facie* obviousness.

Applicants respectfully disagree with the Office's characterization of Example 25. Example 25 shows unexpected results, although the Office appears to suggest that the product has not been extruded. Applicants teach on page 43, lines 15-16, (i.e., "PUFA biomass was processed according the route described in Example 1 (filtration, extrusion and drying)") and page 44, lines 4 and 27, of their specification that the biomass indeed was extruded. Thus, Applicants respectfully request the Office to reconsider the advantageous results of the invention.

Finally, the Office has not established a reasonable expectation of success from the prior art. On page 4 of the Action, the Office appears to suggest that combining the cited documents would be expected to be successful due to "the expected economic benefits of obtaining a dried stable microbial product that is easy to manipulate and a cost of which is reduced." Applicants respectfully submit, however, that the purported expectation of success is not directed to the granules as claimed. Such granules have enhanced extractability and there is no expectation in any of the cited documents that such enhanced extractability can be successfully achieved.

Cited Documents Does not Provide Reasonable Expectation of Success of Producing Granules by Extrusion and Drying to Extract Fatty Acids from Mortierella

The Office cites Barclay and Huang as disclosing extrusion to produce granules from fungal cells. In the past, the Office alleged that Barclay recognizes that any oil available from fungal mycelia would be more readily extractable upon extruding. But Barclay only mentions extrusion with respect to the particular microorganisms (i.e., thraustochytrids) which comprise the invention and does not suggested that extrusion will make any oil readily extractable. In contrast, Barclay discloses that *Mortierella* is a poor candidate for producing ω-3 highly unsaturated fatty acids at col. 3, lines 36-52.

> A few higher fungi are known to produce omega-3 highly unsaturated fatty acids, but they comprise only a very small fraction of the total fatty acids in the cells (Erwin, 1973; Wassef, 1977; Weete, 1980). As such, they would not be good candidates for commercial production of omega-3 highly unsaturated fatty acids. For example, Yamada et al. (1987) recently

> reported on the cultivation of several species of the fungus, Mortierella, (isolated from soils) for the production of the omega-6 fatty acid, arachidonic acid. These fungi also produce small amounts of omega-3 eicosapentaenoic acid along with the arachidonic acid when grown at low temperatures (5°-24° C.). However, the resulting eicosapentaenoic acid content was only 2.6% of the dry weight of the cells, and the low temperatures necessary to stimulate production of this fatty acid in these species would result in greatly decreased productivities (and economic potential) of the cultivation system

Barclay specifically names *Thraustochytriales* as the microorganisms having a high concentration of fatty acids. He also notes col. 4, lines 2-4, "Although some prior art classifies the thraustochytrids as fungi, the most recent consensus is that they should be classified as algae." Not only does Barclay not include *Mortierella* as a microorganism of interest, but he also prefers algae over fungi as sources of fatty acids. The other document Huang only mentions *Fusarium* and *Penicillium* for extrusion. To obtain fatty acids, Barclay and Huang do not teach or suggest selecting *Mortierella* instead of using other microorganisms (and Barclay prefers algae). Thus, there is no reasonable expectation of success established by the cited documents to use extrusion and drying to produce granules of *Mortierella* from which fatty acids are extracted.

Huang does not teach or suggest extracting fatty acids at all. And in Barclay, the extraction process is contrasted with the process for preparing animal feed. Extraction is described at cols. 12-13. Cellular lipids containing fatty acids are described as being extracted from microbial cells, or the cells lysed and then oils extracted. In a preferred process disclosed at col. 13, lines 7-38:

> The harvested cells (fresh or dried) can be ruptured or permeabilized by well-known techniques such as sonication, liquid-shear disruption methods (e.g., French press of Manton-Gaulin homogenizer), bead milling, pressing under high pressure, freeze-thawing, freeze pressing, or enzymatic digestion of the cell wall. The lipids from the ruptured cells are extracted by use of a solvent or mixture of solvents such as hexane, chloroform, ether, or methanol. The solvent is removed (for example by a vacuum rotary evaporator, which allows the solvent to be recovered and reused) and the lipids hydrolyzed by using any of the well-known methods for converting triglycerides to free fatty acids or esters of fatty acids including base hydrolysis, acid hydrolysis, or enzymatic hydrolysis. The hydrolysis should be carried out at as low a temperature as possible (e.g., room temperature to 60°C.) and under nitrogen to minimize breakdown of

> the omega-3 HUFAs. After hydrolysis is completed, the nonsaponifiable compounds are extracted into a solvent such as ether, hexane or chloroform and removed. The remaining solution is then acidified by addition of an acid such as HCl, and the free fatty acids extracted into a solvent such as hexane, ether, or chloroform. The solvent solution containing the free fatty acids can then be cooled to a temperature low enough for the non-HUFAs to crystallize, but not so low that HUFAs crystallize. Typically, the solution is cooled to between about -60°C. and about -74°C. The crystallized fatty acids (saturated fatty acids, and mono-, di-, and tri-enoic fatty acids) can then be removed (while keeping the solution cooled) by filtration, centrifugation or settling. The HUFAs remain dissolved in the filtrate (or supernatant). The solvent in the filtrate (or supernatant) can then be removed . . .

Barclay's HUFA extraction process does not involve extruding a biomass and then drying to produce granules, followed by extracting fatty acids from the granules. Thus, while Barclay does disclose extrusion to produce animal feed, it does not disclose using extrusion as part of a process for extracting fatty acids as required by Applicants. The cited documents do not teach or suggest using an extrusion step in a process for the purification, extraction, or isolation of fatty acids.

As noted above, Barclay's and Huang's choice of microorganism also teaches away from the claimed invention. And since they are making food products from the microorganisms instead of granules for extracting fatty acids, the cited documents clearly do not disclose that porosity, dry matter content, diameter, or length of granules are result-effective variables to be optimized for extracting fatty acids.

Cited Documents Teach Away from Granules Comprised of Dead Fungi

The Office presumably cited Langejan and Groenendaal to satisfy the need to show the required degree of porosity. Both are concerned with dried yeast preparations that provide high activity upon rehydration. Groenendaal also specifically states that "high porosity gives easy access to water and oxygen (from air) which result in rapid loss of activity upon exposure to atmospheric conditions" (col. 1, lines 58-61). The yeast eventually die. But the document's emphasis on maintaining the viability of yeast cells is clearly different from Applicants' objective of maintaining lipids in granules accessible for processing and maintaining their activity by protecting the oil from oxidation. The

yeast in Langejan's and Groenendaal's granules are alive, they die only upon rehydration. In contrast, the *Mortierella* cells of the compo-sition of claims 68 and 149 are dead. This difference demonstrates that the combination proposed by the Office teaches away from Applicants' invention because the fungi in Langejan's and Groenendaal's granules are not dead.

For the reasons discussed above, Applicants' claimed invention is patentable over the documents cited in the Office Action.

Withdrawal of the Section 103 rejection is requested because the claims would not have been obvious to one of ordinarily skill in the art when this invention was made.

Conclusion

Having fully responded to the pending Office Action, Applicants submit that the claims are in condition for allowance and earnestly solicit an early Notice to that effect. The Examiner is invited to contact the undersigned if additional information is required.

Respectfully submitted,

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